IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Inventor(s): **Mohammad Hossein Zarrabizadeh**

Case: **23**

Serial No.: **10/673,894** Group Art Unit: 2624

Filing Date: **September 29, 2003**

Examiner: **Seyed H. Azarian**

Title: **Watermarking Scheme For Digital Video**

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SIR:

Enclosed is an Amended Appeal Brief in the above-identified patent application.

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Respectfully,

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MICHELE M. RUTTER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Inventor(s):	M. H. Zarrabizadeh		
Case:	23		
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SIR:

Appellant's Brief Under 37 C.F.R. 41.37

This is an appeal to the Board of Patent Appeals and Interferences from the Final Rejection dated November 21, 2007.

A Notice of Appeal was timely filed.

Real Party in Interest

The real party in interest is Lucent Technologies Inc.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1-36 and 38-39 are pending in the application.

Claim 37 is canceled.

Claims 36 and 38 stand allowed.

Claims 7 and 8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 1-6, 9-12, 14-30 and 32-35 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 6,590,996 issued to Reed et al. on July 8, 2003.

Claims 13 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reed et al. in view of United States Patent No. 6,538,599 issued to David on March 25, 2003.

The rejection of claims 1-6, 9-35 and 39 and the objection to claims 7 and 8 is hereby appealed. A copy of the claims under appeal as now presented are appended to this brief in Appendix A.

Status of Amendments

All amendments to the claims have been entered.

Summary of Claimed Subject Matter

Watermarking of video signals is, generally, the inclusion within the video itself of additional information. This can be useful to provide an embedded identification of the source of a video, to keep track of where and for how long a video is played, and to communicate information via the video to an ancillary device. Prior art techniques for watermarking video signals typically encoded the additional information in an analog format within the video itself using the luminance of the video to carry the additional information. However, the human visual system is very sensitive to the luminance signal, and so a person viewing a watermarked signal easily perceives distortion which is caused by the changes made to the video signal to convey the additional information when there is an attempt to increase the bit rate of the additional information beyond a certain point, e.g., beyond 120 bits per second. Thus, although the prior art's techniques of watermarking of video signals has had some success in certain applications, such success

has been limited by the extremely small bit rate that is achievable without perceivable distortion by a person viewing the video signal carrying the additional information.

In previously filed United States Patent Application Serial No. 10/342704, which is incorporated by reference as if set forth fully herein, I, along with my coinventor, recognized that the human visual system is much less sensitive to chrominance than to luminance. Therefore, we developed a system for digital watermarking a video signal that inserts the additional information of the watermarking signal on the chrominance component of the video signal rather than on its luminance signal. Thus, the additional information is "impressed" upon the chrominance component of the video signal. Advantageously, although there may be significant distortion of the chrominance component, especially when the additional information has higher bit rates than is achievable without perceivable distortion by the prior art, nevertheless such distortion will not be detected by the human visual system, provided it is appropriately managed. Thus, the additional information can have a higher bit rate as compared with that achievable by the prior art, e.g., bit rates greater than 150 bits per second can be achieved. Further advantageously, the additional data can be recovered from the video signal even after the video signal watermarked with the additional data is compressed using the Motion Picture Expert Group (MPEG)-1 and MPEG-2 encoding systems.

I have recognized that the system of United States Application Serial No. 10/342704 required multiple frames of the video to accurately transmit the information on the chrominance portion. This can be disadvantageous in some applications, e.g., where finer granularity of the watermarking is required so as to provide better response time and improved resistance to temporal tampering with the video, and under certain conditions, e.g., when there is a scene change, which can occur rapidly in the case of high speed movement such as a chase scene.

In concurrently filed United States Application Serial No. 10/673,892 the watermarking of video is improved by having one or more bits of watermark data carried via an average value of the chrominance component of each of various blocks of the video signal, on up to a per-frame basis. More specifically, one or more bits of the watermark data may be effectively placed into specified bit positions of the average value

of at least a selected portion of the chrominance component of up to each block of up to each frame. Note that typically, there are two chrominance portions, e.g., U and V when the video is represented in the YUV format, in the chrominance component. More specifically, each block of each frame of the original video signal may be modified to carry its own independent one or more bits of the watermark data in the average value of a chrominance portion that is selected to carry the watermark data for that block. Conceptually then, the value of the bit position of the average value of the selected chrominance portion that is to contain the watermark data for a block may be thought of as being replaced by the value of the bit of watermark data to be carried in that block.

Only one of the chrominance portions carries watermark data for any particular block. The chrominance portion selected to carry the watermark data for any block may be independently selected for that block. The bit position of the average value that is replaced is one of the bits of the integer portion of the average value.

If necessary, the values of the selected chrominance portion of individual pixels of a block may be adjusted in order to cause the bit of the average value of the selected chrominance portion of the block that is to carry the watermark data to be the same as the value of the watermark data bit. This may be achieved by changing the value of the selected chrominance portion of various pixels in the block such that over the entire block the average of the value of the chrominance portion is changed so that the value of the select bit position of the average conforms to the value of the watermark data that is being placed in the selected bit position.

If the value of the bit of the average value to contain the watermark data is already the same as the value of the watermark data bit, no change may be performed to any of the pixels of the block. However, if the value of the bit of the average value to contain the watermark data is the complement of the value of the watermark data bit to be carried by the block, at least the minimum change to the average value that will cause the bit to be changed to the value of the watermark data bit is performed on the average value. For example, if the bit of the average value to contain the watermark data is the second least significant bit of the integer portion of the average value, such a bit may always be changed to its complementary value by either adding or subtracting one to the average

value. Doing so is preferable to adding two, which may also be used to always change the bit to its complementary value, because it introduces less change in the value of the average, and hence less change in the block, thereby reducing the chance of introducing a viewer-perceivable artifact. The change to the average value of the selected chrominance portion of a block is implemented by adding or subtracting—, which may be accomplished by adding negative numbers—, a value to the selected chrominance portion of ones of the pixels of the block until the desired change in the average thereof is achieved.

When using block-based frequency domain encoding of the video, such as one of the motion picture experts group (MPEG) standards, e.g., MPEG 1, MPEG 2, MPEG 4, the substitution of the bit of watermarked data may be achieved by adjusting the value of the DC coefficient, which corresponds to the average value, of at least one of the chrominance matrices for the block. For example, the second least significant bit of the DC coefficient for a block is replaced with the value of the watermark bit that is desired to be impressed on the block.

Which bit of the average value of the chrominance portion is designated to carry the watermark data may be a function of a texture variance of the block. It is advantageous to increase the significance of the bit position carrying the watermark data as the texture variance increases, because MPEG-like coding employs greater quantization step sizes for higher texture variances, and the use of such greater quantization step sizes could result in the elimination, e.g., filtering out, of the watermarking data if it is not positioned significantly enough. When using more significant bit positions, the values to be added or subtracted from the average value in order to change the value of a bit position carrying the watermark data to its complementary value may be greater than one. Any texture variance may be used, e.g., the texture variance of Y, U, or V, or a combination thereof.

Whether or not the bit position carrying the watermark data was changed to its complement, a "margin" value may be added to the average value in order to better ensure that the bit of watermark data carried by the average value of the block survives

any MPEG-like encoding, while minimizing the likelihood of perceivable artifacts resulting.

A receiver determines which of the chrominance components of a block are carrying the watermark data and extracts the bit of watermark data from the selected bit position of the integer portion of the average value of that chrominance component. The selected bit position may be determined from a texture variance of the block, e.g., the texture variance of the determined chrominance portion of the block or the texture variance of the luminance component.

Advantageously, better response time and improved resistance to temporal tampering with the video is achieved with respect to the prior art. Further advantageously, scene changes do not introduce errors into the impressed data. Yet an additional advantage is that even if the original pixel domain version of the video is not available, but only a block-based frequency domain encoded version thereof, the video may be watermarked without conversion back to the pixel domain.

While concurrently filed United States Application Serial No. 10/673,892 provides significant advantages heretofore explained, I have recognized that with certain color combinations there is still, disadvantageously, the possibility that the additional data could cause a slightly visible flickering. Furthermore, in United States Application Serial No. 10/673,892 there is no indication as to the quality of the extracted data at the receiver.

Therefore, in accordance with the principles of the instant invention, prior to any data being impressed upon the average value of a chrominance portion of a block, the data is replicated, at least once, and preferably two or more times. The original and each produced replica is transmitted in the same block position of separate frames using the techniques of concurrently filed United States Application Serial No. 10/673,892. The frames that have like-positioned blocks that are carrying the same data are considered to be a group, and, preferably, the frames thereof are in consecutive in display order.

Furthermore, in accordance with an aspect of the instant invention, specific blocks of the frame may be embedded with a particular known data sequence, e.g., a Barker sequence, rather than encoded user data. In accordance with another aspect of the invention, the specific blocks that are embedded with a known sequence may be scattered

throughout the blocks of a frame. Each group may employ a different known sequence, or the same sequence may be used for different consecutive groups.

In accordance with an aspect of the invention, instead of simply repeating the data for each like-positioned block of a group, the amount added to the average value for each block based on its complexity may be changed slightly from frame to frame for like positioned blocks over the group, even when the complexity of the blocks is the same. Doing so provides additional coding gain that is advantageous to improve the reliability of the data at the receiver. However, doing so may cause a slight reduction in the visual quality of low texture areas, because a few pixels within the block may have different values than their predecessors in the same location. Nevertheless, because such visual quality reduction is at the pixel level, it is typically not noticeable.

At a receiver, the multiple instances of the same data bit in successive frames are extracted and combined to form a single received bit. In accordance with an aspect of the invention, the known data sequence can be used to determine the quality of each of the particular frames. The determined quality is used to specify a weight for the frame, and the values of the extracted data from each frame may be treated as soft data that is weighted by its associated weight as part of the combining process. If the determined quality of a particular frame is below a prescribed threshold, it may be assumed that the particular frame does not contain any watermarking data and no data is extracted for that frame.

For all of the independent claims, the element of impressing bits of additional information by placing the bits into at least one selected bit of an average value of a chrominance portion of the video signal and for extracting such bits is generally supported in the specification at least at page 1, line 23 to page 4, line 19, page 6, line 35 to page 46, line 34 and FIGs. 1-8.

Independent claim 1 relates to a method for use in watermarking a video signal, the method including the steps of replicating at least selected ones of bits of additional information to be impressed upon a video signal by placing the bits into at least one selected bit of an average value of a chrominance portion over a block of the video signal and supplying the original and replicated bits to be impressed in the same block position

in successive frames. FIG. 9 shows an exemplary transmitter for performing the method, and in particular repeater 925 and bit mapper 923. Corresponding support in the specification is found at least at page 4, line 21 through page 5, line 15; page 47, line 1 through line 23; and page 50, line 1 through page 52, line 10.

Independent claim 20 relates to a method for use with a receiver of a video signal containing additional information impressed upon a chrominance portion of the video signal including the steps of combining extracted initial additional information of like block positions from prescribed frames to determine the final additional information and supplying as an output the final additional information. Corresponding support in the specification is found at least at page 5, line 16 through line 24 and page 49, line 6 through line 11; page 52, line 11 through page 53, line 15, and FIG. 10.

Independent claim 29 relates to an apparatus for use in watermarking a video signal, including means for replicating at least selected ones of bits of additional information to be impressed upon a video signal by replacing a selected bit of an average value of a chrominance portion over a block of the video signal and means for supplying the original and replicated bits to be impressed in the same block position in successive frames. Corresponding support in the specification is found at least at page 4, line 21 through page 5, line 15; page 47, line 1 through line 23; page 50, line 1 through page 52, line 10; and FIG. 9. In particular, the means for replicating may be implemented as repeater 925 and the means for supplying may be implemented as bit mapper 123 or bit mapper 923, such elements being described at page 47, lines 10 through 23.

Independent claim 30 relates to a method for use in watermarking a video signal, the method including the step of inserting in prescribed block positions of prescribed frames of the video signal at least one unique identifying code by replacing a selected bit of an average of a chrominance portion over the blocks. FIG. 9 shows an exemplary transmitter for performing the method, and in particular optional sequence adder 927. Corresponding support in the specification is found at least at page 4, line 21 through page 5, line 15; page 47, line 24 through line 31; and page 48, line 20 through page 49, line 36.

Independent claim 39 relates to a method for use in watermarking a video signal, the method including the steps of replicating at least one bit of additional information to be impressed upon the video signal; and supplying the original and replicated bits in a manner so that they are to be impressed in the same block position in successive frames; wherein the original and replicated bit are each impressed upon their respective block of the video signal by placing their respective values in at least one bit position of an average value of a chrominance portion over the respective blocks. FIG. 9 shows an exemplary transmitter for performing the method, and in particular repeater 925 and bit mapper 923. Corresponding support in the specification is found at least at page 4, line 21 through page 5, line 15; page 47, line 1 through line 23; and page 50, line 1 through page 52, line 10.

Grounds of Rejection to be Reviewed on Appeal

I. Are claims 1-6, 9-12, 14-30 and 32-35 and 39 properly rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 6,590,996 issued to Reed et al. on July 8, 2003.

II. Are claims 13 and 31 properly rejected under 35 U.S.C. 103(a) as being unpatentable over Reed et al. in view of United States Patent No. 6,538,599 issued to David on March 25, 2003.

Argument

Issue I –Rejection Under 35 U.S.C. 102(b)

Claims 1-6, 9-12, 14-30 and 32-35 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 6,590,996 issued to Reed et al. on July 8, 2003.

The Office Action essentially states that Reed et al. teaches all the limitations of applicant's independent claims. This ground of rejection is respectfully traversed for the following reasons.

First, it seems best to turn first to independent claim 20, which relates to detecting the watermark, since the Office Action initially cites a section of Reed al. that relates to

repeating the bits of the watermark frames for multiple images in the section of the Final Office Action that is specifically responding to applicant's previous amendment.

Independent claim 20 requires combining extracted initial additional information of like block positions from prescribed frames to determine the final additional information. Thus, what must be combined according to claim 20 is extracted initial additional information, i.e., initially extracted watermark data, from like block positions.

However, what is combined by Reed et al. in the section thereof cited by the Office Action, namely, column 20, lines 2-14, is explained further in Reed et al. at column 20, line 15 to column 21, line 41, especially, column 21, lines 35-41. From the entirety of the explanation, it is clear that what is combined by Reed et al. is **not** initially extracted additional information. Rather, Reed et al. is combining the image data of multiple images (frames of native image data (932)), which is the entire image combined with the watermark. This is clearly different from extracted initial additional data, i.e., **only** watermark data, that is required to be combined by applicant's claim. In other words, Reed et al. is combining the image data and the water mark data as emebedded within the image, rather than combining only watermark data after it was already extracted from the image, as required by applicant's independent claim 20.

More specifically, applicant notes that columns 20 and 21 of Reed are directed to Detector Pre-Processing, as indicated at column 20, line 1. In other words, the watermarked image is being prepared for detecting the watermark, but **no** watermark data extraction actually takes place in the cited section, nor has watermark data extraction already taken place. In fact, actually detecting a raw watermark bit is **not** described in Reed et al. until much later, starting at column 30, line 53, and continuing until column 32, line 22. That section clearly shows that one bit is extracted from each block that might contain a bit, and this processing is done only within a single frame, which may be a preprocessed frame, i.e., a frame that was filtered or otherwise processed, which may include having been combined with another frame.

That only data for a single frame is extracted is made especially clear from column 32, lines 1-7 and 15-18, which explains that when the read is invalid, the detection process, if it cannot orient the image to produce a valid read, re-starts the

detection process on a new frame, in the case that there actually is more than one frame available with the same watermark data. This implies that even when there are extra frames containing the same watermark data, Reed et al. gives up on all the work that was done on the current frame and starts over with the next, new frame of image data.

Never, however, does Reed et al. suggest that initially extracted information of like block positions from different frames be combined, as required by independent claim 20. This appears to be because when a frame contains valid data, that is sufficient for Reed et al., but when the data is considered invalid, such data is deemed to be completely invalid and unsuitable for any use.

Thus, since Reed et al. at best combines various watermarked images, but never the extracted initial additional information from like block positions for prescribed frames, independent claim 20 is allowable over Reed et al.

Turning next to applicant's independent claims 1, 29, 30, and 39 which relate to embedding the watermark data in a video signal, each of these claims requires that the watermark data be impressed upon each block to contain it by being placed in at least one bit position of an average value of a chrominance portion over the respective blocks. This is **not** taught by Reed et al.

The Office Action cites column 5, lines 48-54 of Reed et al. as showing this element. However, the cited language only shows that the watermark data of Reed et al. may be generally embedded in one or more color components of an image. In other words, Reed et al. teaches that a color component may be changed in a fashion such that it represents the watermark data. But Reed et al. does **not** teach or suggest that the watermark data is placed in at least one bit position of an average value of a chrominance portion over the respective blocks.

Rather, Reed et al. teaches employing the average color of the block to look up the corresponding color channels in which to embed the watermark. (See Reed et al. column 2, lines 40-52, column 38, lines 10-47.) More specifically, Reed et al. teaches that the encoder combines the image samples in the watermark signal with the corresponding samples in the input image. The result is that some image samples of the input image are adjusted upward, while others are adjusted downward.

However, there is no teaching to manipulate the average of any block in the particular way necessary to place the watermark bit in at least one bit position of the average value of a chrominance portion over a block. While the effect of the modifying of the input image in Reed et al. when it is combined with the watermark signal probably changes the average value of the block, such a change is clearly not intended to, and except for random occurrences, does **not**, place the value of the watermark bit being embedded in that block within at least one bit position of the block. This is because placing the watermark bit within a bit position of the average value of a block means generally, and, as explained in the specification, that once the bit position in the average value is known the value is simply read from that bit position.

Nothing like this is taught in Reed et al., where the detection process is described, for example, at column 12, lines 11-67, which uses estimates of the watermark signal, predictions of the original unwatermarked signal, and the carrier, to develop values for each raw bit. Thus, the modifications of the image to add thereto the watermark data by Reed et al. do not place the actual bit values of the watermark data into at least one selected bit of the average value of the chrominance potion of a block, as required by applicant's independent claims 1, 29, 30, and 39.

Thus, all of applicant's independent claims are allowable over Reed et al.

Since all of the dependent claims that depend from the currently amended independent claims include all the limitations of the respective independent claim from which they ultimately depend, each such dependent claim is also allowable over Reed et al. under 35 U.S.C. 102.

Issue II –Rejection Under 35 U.S.C. 103(a)

Claims 13 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reed et al. in view of United States Patent No. 6,538,599 issued to David on March 25, 2003.

Each of these grounds of rejection applies only to dependent claims, and each is predicated on the validity of the rejection under 35 U.S.C. 102 given Reed et al. Since the rejection under 35 U.S.C. 102 given Reed et al. has been overcome, as described

hereinabove, and there is no argument put forth by the Office Action that David supplies that which as set forth above is missing from Reed et al. to render the independent claims anticipated, and indeed it does not do so, this grounds of rejection cannot be maintained.

Therefore, applicant's claims are allowable over the combination of Reed et al. and David under 35 U.S.C. 103(a).

Conclusion

In view of the foregoing, it is submitted that the Examiner is in error. It is, accordingly, respectfully requested that the rejection of claims 1-6, 9-13, 14-30 and 31-35 and 39 and the objection to claims 7 and 8 be reversed and the application passed to issue.

Respectfully,

M. H. Zarrabizadeh

By _____

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Lucent Technologies Inc.

Date: January 16, 2009

Claims Appendix

Claims

1. A method for use in watermarking a video signal, the method comprising the steps of:

replicating at least selected ones of bits of additional information to be impressed upon a video signal by placing said bits into at least one selected bit of an average value of a chrominance portion over a block of said video signal; and

supplying said original and replicated bits to be impressed in the same block position in successive frames.

2. The invention as defined in claim 1 wherein said block position is based on said video signal having one Y, one U and one V value for every 2x2 block of full resolution of an original input video signal.

3. The invention as defined in claim 1 wherein all of said bits of additional information that are to be impressed on a first one of said successive frames are replicated to be impressed on at least a second one of said successive frames that is for display without any frame being displayed between said first frame and said second ones of said successive frames.

4. The invention as defined in claim 1 further comprising the step of adding an offset bias to an average value of a chrominance portion of at least one block of at least one frame of said successive frames that have said original and replicated bits impressed upon them in the same block positions.

5. The invention as defined in claim 4 wherein said offset bias is independent of a busyness measure of said block.

6. The invention as defined in claim 4 wherein said offset bias is independent of any value added to said average value to bring said average value within a safe range.

7. The invention as defined in claim 4 wherein said offset bias is a first offset bias that is a positive value added to a first one of said successive frames, and wherein said method further comprises the step of adding a second offset bias to an average value of a chrominance portion of at least one block of at least a second frame of said successive frames that have said original and replicated bits impressed upon them in the same block positions, said second offset bias being a negative value.

8. The invention as defined in claim 4 wherein said offset bias is a first offset bias that is a positive value added to a first one of said successive frames, and wherein said method further comprises the step of adding a second offset bias to an average value of a chrominance portion of at least one block of at least a second frame of said successive frames that have said original and replicated bits impressed upon them in the same block positions, said second offset bias being a negative value and said at least one block of said at least second frame being like-positioned within said at least second frame as said at least one block of said first frame.

9. The invention as defined in claim 4 wherein said offset bias is small relative to the change required in said average value to place said bits into said at least one selected bit of an average value.

10. The invention as defined in claim 4 wherein additions are made to the chrominance portion of ones of the pixels of said at least one block until total of such additions equals the product of said offset bias and the number of pixels in a block, said additions being independent of any other changes made to the chrominance portion of said ones of the pixels.

11. The invention as defined in claim 1 further comprising the step of including a prescribed data sequence within said additional information to be impressed upon a chrominance portion of said video signal.

12. The invention as defined in claim 11 wherein said prescribed data sequence is known to a receiver of said video signal after it is watermarked.

13. The invention as defined in claim 11 wherein said prescribed data sequence is a Barker sequence.

14. The invention as defined in claim 11 wherein said prescribed data sequence is impressed, at least in part, upon prescribed blocks of at least one frame of said video signal.

15. The invention as defined in claim 11 wherein said prescribed data sequence is impressed in its entirety upon prescribed blocks of one frame of said video signal.

16. The invention as defined in claim 11 wherein said prescribed data sequence is impressed upon like-positioned prescribed blocks of multiple ones of frames of said video signal.

17. The invention as defined in claim 11 wherein replicas of said prescribed data sequence in its entirety are impressed upon like-positioned prescribed blocks of respective ones of multiple frames of said video signal.

18. The invention as defined in claim 1 further comprising the step of including a known data sequence within said additional information to be impressed upon a chrominance portion of said video signal, wherein said known data sequence is intermixed among said additional information so as to be scattered among the blocks of a frame.

19. The invention as defined in claim 1 further comprising the step of including a known data sequence within said additional information to be impressed upon a chrominance portion of said video signal, wherein said known data sequence is intermixed among said additional information so as to be scattered among the blocks of a frame, said scattering being different for different suppliers of said additional information.

20. A method for use with a receiver of a video signal containing additional information impressed upon a chrominance portion of said video signal, the method comprising the step of:

combining extracted initial additional information of like block positions from prescribed frames to determine the final additional information;

supplying as an output said final additional information.

21. The invention as defined in claim 20 wherein said prescribed frames are successive frames.

22. The invention as defined in claim 20 wherein said prescribed frames are successive frames as transmitted in said video signal.

23. The invention as defined in claim 20 wherein said prescribed frames are successive frames when displayed.

24. The invention as defined in claim 20 further comprising the step of determining a quality of each of said prescribed frames that are combined in said combining step; and

wherein in said combining step said initial additional information of like block positions from said prescribed frames is combined as a function of said determined quality for each of said prescribed frames.

25. The invention as defined in claim 21 wherein said determined quality for each of said frames is a function of the number of errors in each of said frames for a known data sequence which is embedded in expected ones of the blocks of each of said frames.

26. The invention as defined in claim 21 wherein when said determined quality for a frame is below a prescribed threshold, said frame is treated as if it contains no additional information.

27. The invention as defined in claim 21 wherein said determined quality is expressed as a weight value, one weight value being developed for each frame.

28. The invention as defined in claim 21 wherein said final additional information is supplied to a channel decoder which treats said final additional information as soft bits.

29. Apparatus for use in watermarking a video signal, comprising:

means for replicating at least selected ones of bits of additional information to be impressed upon a video signal by replacing a selected bit of an average value of a chrominance portion over a block of said video signal; and

means for supplying said original and replicated bits to be impressed in the same block position in successive frames.

30. A method for use in watermarking a video signal, the method comprising the steps of:

inserting in prescribed block positions of prescribed frames of said video signal at least one unique identifying code by replacing a selected bit of an average of a chrominance portion over said blocks.

31. The invention as defined in claim 30 wherein said identifying code is a Barker sequence.

32. The invention as defined in claim 30 wherein said prescribed code identifies said prescribed frames as belonging to a unitary sequence.

33. The invention as defined in claim 30 wherein said prescribed code identifies said prescribed frames as belonging to a unitary sequence, and said method further comprising the step of:

inserting in other prescribed block positions of said prescribed frames at least one secondary unique identifying code by replacing a selected bit of an average of a chrominance portion over said blocks.

34. The invention as defined in claim 33 wherein said at least one secondary unique identifying code is made up of a series of codes that distinctly identifies individual frames of said prescribed frames.

35. The invention as defined in claim 33 wherein said at least one secondary unique identifying code is made up of a series of codes that distinctly identifies groups of frames of said prescribed frames, at least one of said groups of frames including a plurality of frames.

36. A receiver for extracting additional information from a video signal containing said non-video information impressed upon a chrominance portion of said video signal, comprising

an extractor for extracting said non-video information from said video signal; and

a sequence processor receiving at least said extracted non-video information and detecting at least one prescribed sequence that was impressed upon at least one frame of said video signal and for determining a number of errors in said at least one prescribed sequence for each of a plurality of grouped frames: and

a frame weighting unit which uses a per-frame quality measure derived as a function of said number of errors in each of said plurality of frames to combine extracted like-block positioned non-video information from said plurality of frames into an output value for said block position for said grouped frames.

37. (canceled)

38. A receiver for extracting additional information from a video signal containing said non-video information impressed upon a chrominance portion of said video signal, comprising

an extractor for extracting said non-video information from said video signal; and

a sequence processor receiving at least said extracted non-video information and detecting at least one prescribed sequence that was impressed upon at least one frame of said video signal and for determining a number of errors in said at least one prescribed sequence for each of a plurality of grouped frames:

a frame weighting unit which uses a per-frame quality measure derived as a function of said number of errors in each of said plurality of frames to combine extracted like-block positioned non-video information from said plurality of frames into a soft data output value for said block position for said grouped frames; and

a channel decoder for decoding said soft values.

39. A method for use in watermarking a video signal, the method comprising the steps of:

replicating at least one bit of additional information to be impressed upon said video signal;

supplying said original and replicated bits in a manner so that they are to be impressed in the same block position in successive frames;

wherein said original and replicated bit are each impressed upon their respective block of said video signal by placing their respective values in at least one bit position of an average value of a chrominance portion over said respective blocks.

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Evidence Appendix

none

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Related Proceedings Appendix

none